The applicants respectfully traverse the rejection of claims 1-11 under 35 USC 103(a) over Sakaki et al. in view of Tsubaki et al. These references do not make the presently claimed invention to be obvious.

Before addressing the cited references, the applicants provide the following remarks which are believed to be helpful in understanding the field of the invention.

The ink-jet recording sheet of the present invention comprises the following elements as presently defined in pending claim 1:

1) At least one ink-receptive layer provided on a water resistant support;

2) The ink-receptive layer contains fumed silica fine particles having an average primary particle diameter of 20 nm or less in an amount of 8 g/m^2 or more;

3) The ink-receptive layer contains a hydrophilic binder in an amount of 50% by weight or less based on the amount of the fumed silica; and

4) The ink-receptive layer contains at least one water-soluble polyvalent metal compound.

With respect to the above characteristics of the claimed invention, the water resistant support is used to obtain photo-like glossiness and excellent water fastness.

In the field of an ink-jet recording material, a paper support has been conventionally and generally used. The paper support absorbs ink, so that the paper support itself functions as an ink-receptive layer whereby it has the advantage that a high ink-absorption property can be obtained.

However, when a paper support is used, photo-like glossiness and excellent water fastness, which are objects to be accomplished by the present invention, cannot be obtained.

Thus, it is an object of the present invention to obtain an ink-jet recording

material having photo-like glossiness and excellent water fastness by using a water-resistant support.

In order to obtain high glossiness, it is important to use ultrafine particles having an average primary particle size of 20 nm (0.02 μm) or less. However, such ultrafine particles do not generally give a high ink-absorption property. On the other hand, fumed silica is different from the other fine particles and has characteristics that provides high glossiness and a high ink-absorption property.

As disclosed on page 5, line 25 to page 6, line 14 of the present specification, in a synthesized silica, there are two types of synthesized silicas, one of which is silica synthesized by a wet process (precipitated silica as a representative wet process) and the other process is silica synthesized by a gas phase process (fumed silica). However, synthesized silica generally means a silica synthesized by the wet process.

Turning to the cited references, the synthetic silica having an average particle size of 5 to 30 μm mentioned at column 8, lines 14-22 of Sakaki et al. is silica synthesized by the wet process. In contrast, the fumed silica of the presently claimed invention has an average particle diameter of 50 to 500 nm (0.05 to 0.5 μm) even in the state of secondary particles as disclosed on page 7, lines 7 to 11 of the present specification.

The water-resistant support of the presently claimed invention does not absorb ink at all, so that the ink-receptive layer is required to absorb ink as much as possible. To heighten the ink-absorption property of the ink-receptive layer, it is necessary for the fumed silica to be present in an amount of 8 g/m^2 or more, and an amount of a hydrophilic binder in the ink-receptive layer is made small in an amount of 50% by weight or less. When an amount of the fumed silica is increased and an

amount of the hydrophilic binder is reduced, then cracks are likely caused at the surface of the ink-receptive layer. This problem of surface cracks particularly occurs when fumed silica having an average primary particle size of 20 nm or less is used.

When the synthesized silica and aluminum oxide particles of Sakaki are used, the problem of surface cracks at the surface of the ink-receptive layer scarcely or never occurs as compared with the fumed silica of the present invention.

In the presently claimed invention, photo-like high glossiness and an excellent ink-absorption property can be accomplished by providing an ink-receptive layer comprising fumed silica fine particles having an average primary particle diameter of 20 nm or less in an amount of 8 g/m^2 or more and a hydrophilic binder in an amount of 50% by weight or less based on the amount of the fumed silica on a water-resistant support by coating. However, the problem of surface cracks inherent to the fumed silica having an average primary particle diameter of 20 nm or less occurs by the constitution discussed above. With respect to the present invention, it was found that this problem can be solved by using a water-soluble polyvalent metal compound in the ink-receptive layer.

The above discussed specific combination for the present invention is not known in the prior art, and the effects of the present invention obtained by using the fumed silica having an average primary particle diameter of 20 nm or less and the water-soluble polyvalent metal compound in combination is not suggested by the prior art.

Thus, the applicants submit that the presently claimed invention is not suggested or made obvious by the teachings of the prior art.

A purpose of Sakaki is to prevent decoloration of a recorded image by using aluminum oxide particles having a BET specific surface area within the range of 170

m^2/g or less, and to absorb a solvent in ink into a lower layer which comprises a base paper or a synthetic silica (see column 3, lines 44 to 63 and column 5, lines 31-41 of Sakaki). A surface layer of a recording medium according to Sakaki does not absorb or retain whole inks attached thereto, and the surface layer has a function of transferring whole ink solvents to the lower layer having ink absorptivity. Accordingly, the thickness of the surface layer and the total amount of a pigment of the surface layer is made as small as possible, as disclosed at column 5, lines 42-64 of Sakaki.

In the preferred embodiments of Sakaki, there are the following two types of embodiments, as disclosed at column 6, lines 42 to 54 of the reference:

(1) the embodiment in which a surface layer is provided on an liquid absorptive base paper, and the base paper also functions as the ink absorptive lower layer; and

(2) the embodiment in which a pigment layer with excellent ink absorptivity is provided on a base paper, on which a surface layer is provided.

Of these two embodiments, the above embodiment (1) is the most preferred embodiment in Sakaki.

In Sakaki, the base paper which is a support also functions as the ink absorptive lower layer. On the other hand, the water-resistant support of the present invention does not absorb ink. Thus, the support of the present invention and the support of Sakaki are fundamentally and inherently different from each other.

Additionally, as described above, the recording medium of Sakaki includes a two layer constitution comprising a surface layer adsorbing a dye and a lower layer absorbing an ink solvent. In the surface layer, a total amount of a pigment thereof shall be made small as 0.3 to 7 g/m^2 to smoothly transfer the ink solvent to the lower

layer as disclosed at column 5, lines 49-51 and claim 1 of Sakaki.

However, if the pigment is provided in excess of 7 g/m^2, there will be significant problems such as lowering ink absorptivity, as disclosed at column 5, lines 54-60 thereof. Thus, in Sakaki, no technical idea is disclosed or suggested to include a pigment in an amount of 8 g/m^2 or more but rather to reduce the amount contrary to the present invention.

To the contrary, in the present invention, the fumed silica is present in an amount of 8 g/m^2 or more. Thus, the present invention, using a water resistant support, and Sakaki, using a base paper as an ink absorptive lower layer, are significantly different from each other in basic technical concept.

In embodiment (2) of Sakaki (as listed above), a base paper is used as a support and an ink holding layer comprising synthetic silica is provided between the base paper and the surface layer. However, as disclosed at column 8, lines 10 to 22 of Sakaki, the pigment to be used in the ink holding layer has a size larger than that of the aluminum oxide particles, and preferred range thereof is 5 to 30 μm. Thus, the synthetic silica to be used in the ink holding layer is intended to have a larger particle size.

In contrast, the pigment employed in the present invention is fumed silica having an average primary particle diameter of 20 nm (0.02 μm) or less. Accordingly, the present invention is significantly different from that of Sakaki.

Furthermore, the synthetic silica having a large particle size used in Sakaki is not fumed silica as used in the present invention.

Additionally, in accordance with the invention of Sakaki, silica is never used in the surface layer, as disclosed at column 4, lines 33 to 41 thereof.

Sakaki discloses the use of a polyaluminum hydroxide or a polyaluminum

chloride in the surface layer containing aluminum oxide particles, as described at column 9, lines 16-21 of the reference. However, these aluminum compounds are used to improve water resistance and light resistance of the recorded image, as described therein. Sakaki neither discloses or suggests that these aluminum compounds improve surface cracks of an ink-receptive layer as in the presently claimed invention.

As described in detail above, the present invention and Sakaki are quite different inventions in inventive concept and actual constitution from each other. Thus, it is clear that the presently claimed invention can not result by reference to Sakaki

The cited secondary reference of Tsubaki et al. (USP 6,335,102) does not remedy the deficiencies of Sakaki et al.

Tsubaki discloses a polyolefin resin coated paper as a support for an imaging material. An ink-jet recording material is disclosed as an imaging material.

However, as described above, the support of Sakaki is important to function as an ink absorptive layer. Accordingly, in the invention of Sakaki, there is no intention to use a water resistant support as used in the present invention or Tsubaki.

Thus, little less relationship between Sakaki and Tsubaki, and a person of ordinary skill in the art would find no suggestion or motivation to combine these references. The applicants assert that the combination of references is not tenable and should accordingly be withdrawn.

However, even if these two references could be combined, the constitution of the presently claimed invention cannot be obtained therefrom for the reasons stated above. The presently claimed invention is not obvious over Sakaki in view of

Tsubaki.

In order to show more clearly that the presently claimed invention shows new and unexpected results compared to Sakaki the applicants have performed side-by-side comparative experiments. A description of the experiments and the experimental results are set forth in a Rule 132 Declaration which is attached to this Amendment.

The Examine is asked to carefully read the attached Rule 132 Declaration.

The Declaration shows differences in ink-absorption property and glossiness using aluminum oxide particles and synthetic silica as demonstrated by the Sample of the presently claimed invention and the three Comparative Sampes 1-3. Referring to the Table of results at page 4 of the Declaration, it can be seen that the ink jet recording material of the present invention provides new and unexpected results of high glossiness and excellent ink absorption.

Thus, the presently claimed invention is not obvious over Sakaki and the deficiencies can not be remedied by the teachings of Tsubaki.

Additionally, the applicants submit that the presently claimed invention is not obvious over Sakaki et al. even when it is combined with the other cited references, i.e., Santo et al. and Kasahara et al. in the other rejections of the claims, based upon the primary reference of Sakaki et al.

However, of special note with respect to the subject matter of claim 10 of the present application, a water- soluble plasticizer of polyvinyl alcohol is present. Also, with respect to claim 11 of the present application, there is recited urea or glycerin as the water-soluble plasticizer. "Urea resin" described at column 6, lines 7-14 of Sakaki or column 9, line 5 of Santo et al. is "an organic pigment". In Sakaki, the organic pigment comprising the urea resin is used in the same object as in an

inorganic pigment such as silica and is water insoluble. However, the urea used in the presently claimed invention is not a resin but a water-soluble plasticizer. Thus, they are significantly different from each other.

The presently claimed invention is fully allowable under Section 103(a) in view of the cited prior art.

In view of the above and the attached Rule 132 Declaration, it is believed that this application is in condition for allowance and a Notice to that effect is respectfully requested.

Respectfully submitted,

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